MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1 2017/2018

TSE3151/TSD2711 – SOFTWARE DESIGN
(All Sections/Groups)

27 October 2017
3:00 PM – 5:00 PM
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. The total number of pages for this examination paper is thirteen(13) pages including the cover page.

2. This examination paper contains a total of six(6) questions divided into two(2) different sections, Section A and Section B, respectively. Each section contains three(3) questions.

3. You are required to answer a total of four(4) questions. You must answer any two(2) questions from Section A, and any two(2) questions from Section B.

4. Each question carries an equal score of 25 points. The total score for this examination paper is 100 points.

SECTION A
(Answer any two(2) questions in this section)

QUESTION A1

A1(a) Answer the following questions. You may provide examples in your answers.

    (a1) Why is it that software is always a part of some system?

    (a2) What is a design perspective? Give an example of a design perspective.

    (a3) ADT is a good example of a design model idea. What does ADT mean?

    (a4) Why are scenarios extremely important in software design?

    (a5) What is a cross-platform design? Provide one(1) example.

<div align="right">[5 x 2 points = 10 points]</div>

A1(b) Answer the following questions. You may provide examples in your answers.

    (b1) Describe two(2) differences between system and software requirements.

<div align="right">[2 points]</div>

    (b2) Provide one(1) example that explains the occurrence of an inconsistent requirement description.

<div align="right">[2 points]</div>

    (b3) Why is it important to satisfy correctness in Software Requirements Specifications (SRS)?

<div align="right">[2 points]</div>

    (b4) Explain why constraints and assumptions are important in system and software design. Give one(1) example of a constraint and one(1) example of an assumption in software design.

<div align="right">[2 points]</div>

<div align="right">**Continued .....**</div>

A1(c) Refer to figure A1(c) below. Answer the following questions regarding design elements in the software design model.

Figure A1(c) Elements of the software design model
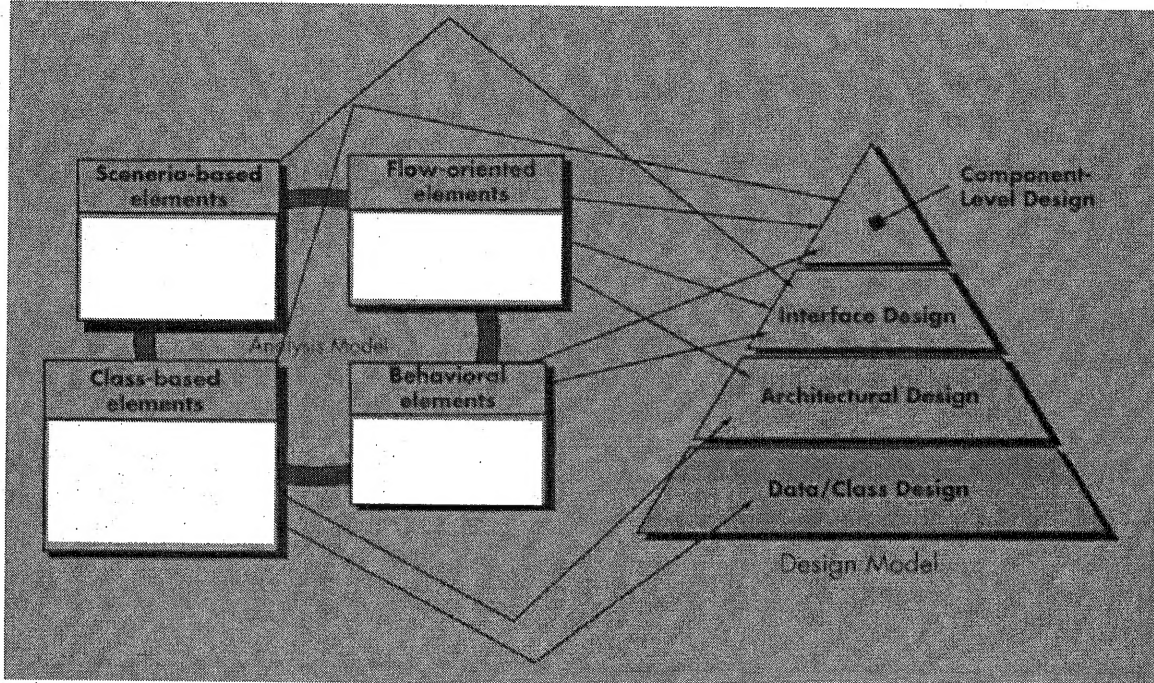
(c1) List two(2) types of diagrams that represent scenario-based elements.

(c2) List two(2) types of diagrams that represent flow-oriented elements.

(c3) List two(2) types of diagrams that represent class-based elements.

(c4) List one(1) type of diagram that represents a behavioural element.

[7 x 1 point = 7 points]

Continued ....

QUESTION A2

A2(a) Answer the following questions. You may provide examples in your answers.

(a1) Discuss the statement, *"A control flow diagram only contains decision elements. "*

(a2) What is the meaning of a complex inheritance hierarchical structure?

(a3) Why is it not correct to say that encapsulation is about information hiding?

(a4) Explain the concept Open-Closed Principle (OCP) in object-oriented design.

(a5) How do we identify class elements in software design?

[5 x 2 points = 10 points]

A2(b) Answer the following questions. You may provide examples in your answers.

(b1) Explain two(2) weaknesses of object-oriented design that makes it unsuitable in some real life applications.

[2 points]

(b2) Describe two(2) differences between procedural and object-oriented design.

[2 points]

(b3) Strong typing is a specific rule for data types in computer systems. Provide one(1) example that explains the use of strong typing in software design.

[2 points]

(b4) The Unified Modeling Language (UML) version 2.5 describes seven(7) types of UML structural diagrams and seven(7) types of UML behavioural diagrams.

List down four(4) types of UML behavioural diagrams.

[2 points]

Note that we use CCCPPOD as our abbreviation for the seven(7) types of UML structural diagrams and USASITC as our abbreviation for the seven(7) types of UML behavioural diagrams. We explained these diagrams in Phase 3 Instructions in our Group Assignment Project for the design of the Intelligent and Automatic Domestic Washing Machine (IADWM).

Continued .....

A2(c) Answer the following questions. You may provide examples in your answers.

Figure A2(c) All functions are global in procedural design
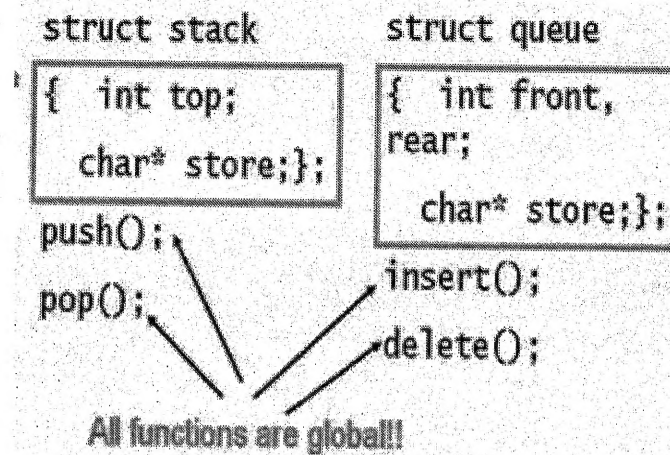
(c1) Describe two(2) implications of global functions against the data structures in Figure A2(c) above.

[4 points]

(c2) How does imperative design play a direct role in Figure A2(c) above?

[3 points]

Continued ...

QUESTION A3

A3(a) Discuss the following software design architectures. You may provide examples in your answers.

(a1) What are the advantages of implementing the N-Tiered software architecture?

(a2) Most software applications today process streaming data (Facebook, Twitter, WhatsApp, etc.). Describe a design architecture that is suitable for streaming data.

(a3) Describe two(2) advantages of the monolithic design architecture.

(a4) Discuss this statement, *"It is not a mandatory requirement in the data-centric architecture design to implement a single centralized database"*.

(a5) *"In Component-Based Software Engineering (CBSE), software component designs must strictly obey specific component standards."* Describe what this statement means.

[5 x 2 points = 10 points]

A3(b) Answer the following questions. You may provide examples in your answers.

(b1) Describe two(2) issues in the design of software for parallel and concurrent execution.

[2 points]

(b2) Provide one(1) real implementation of the Adaptive Loadable Kernel Module (LKM) design architecture.

[2 points]

(b3) *"Conformance to ACID properties is one of the requirements in the design of transaction processing systems"*. Explain what this statement means.
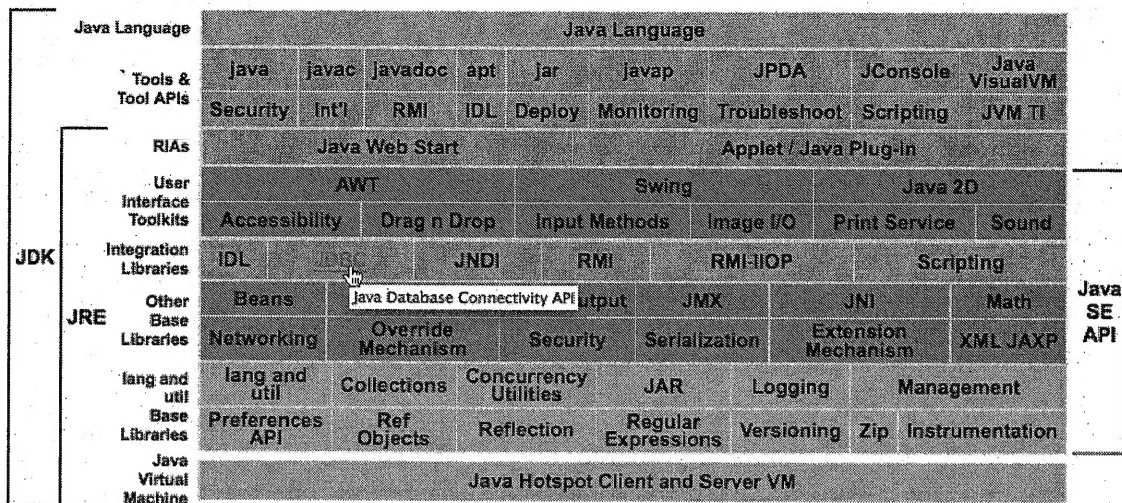
[2 points]

(b4) Provide one(1) concrete example that illustrates the pipes and filters design architecture.

[2 points]

A3(c) Answer the following questions. You may provide examples in your answers.

Figure A3(c) The Java Development Kit (JDK) Software Architecture

(c1) State the differences between java and javac in the Tools and Tools API layer.

[2 points]

(c2) What is the purpose of the IDL package in the Integration Libraries layer?

[2 points]

(c3) What does JAR in the Lang and Util Base Libraries layer mean?

[2 points]

(c4) What is the one(1) main difference between JRE and JDK?

[1 point]

Continued …..

SECTION B
(Answer any two(2) questions in this section)

QUESTION B1

B1(a) Answer the following questions. You may provide examples in your answers.

    (a1) Describe two(2) common methods for interfacing codes with components built using different programming languages.

    (a2) Why is it important to strictly follow instructions of the vendor for hardware interfaces? Provide two(2) reasons.

    (a3) Discuss two(2) viewpoints in Interface Engineering.

    (a4) How does the USB (Universal Serial Bus) interface work?

    (a5) Why do we need transaction servers? Give two(2) examples of popular transaction servers.

                                [5 x 2 points = 10 points]

B1(b) Answer the following questions. You may provide examples in your answers.

    (b1) Describe two(2) differences between multi-threading and multi-processing.

                                [2 points]

    (b2) HDFS (Hadoop Distributed File System) is one of the many types of computer file systems, like FAT, FAT32, NTFS, ext3, ext4 and so on. How does HDFS work?

                                [2 points]

    (b3) The Map-Reduce (MR) processing algorithm is used extensively in parallel and distributed software designs. Explain how Map-Reduce works.

                                [2 points]

    (b4) In parallel computing, a barrier is a type of synchronization method. Describe how barriers are used in distributed and parallel designs of software.
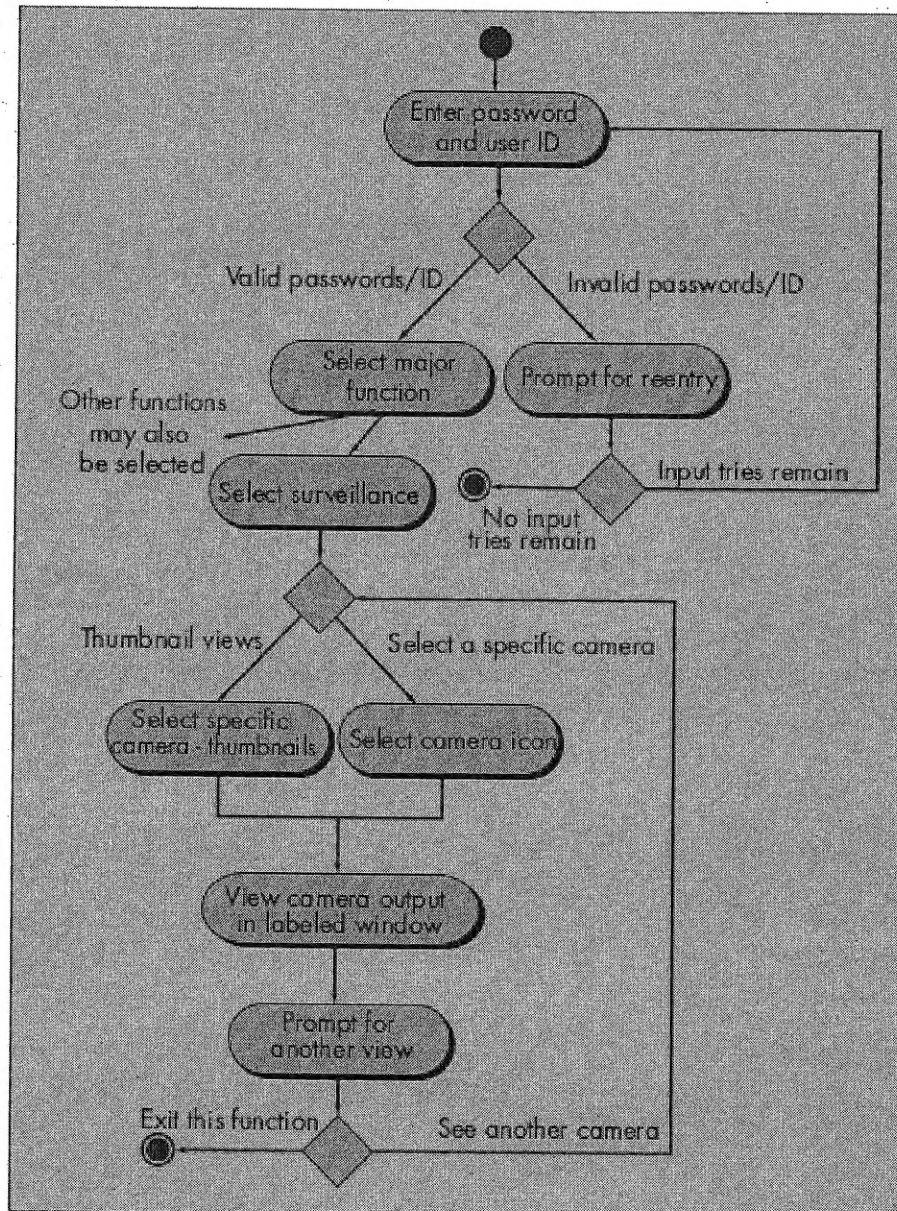
                                [2 points]

B1(c) You are provided with the following design diagram in Figure B1(c). Write in plain English and in complete sentences, your interpretation of the specifications shown in this diagram.

[7 points]

Figure B1(c) An activity diagram

Note: Think of this question as the reverse of the instructions given in your Software Design Group Assignment. In your software design project for the Intelligent and Automated Domestic Washing Machine (IADWM), the instructions are provided as requirements, which are written in plain English and in complete sentences. Out of those requirements, you produce design diagrams. In this question, we provide you with the design diagram Figure B1(c) above, and you are required to produce the requirements.

Continued ....

QUESTION B2

B2(a) Answer the following questions. You may provide examples in your answers.

(a1) List four(4) categories of software design patterns.

(a2) Describe two(2) advantages of implementing software frameworks.

(a3) In algorithm design, describe one(1) situation or one(1) problem where recursive design is better suited over iterative design. Explain why it is better.

(a4) Describe two(2) design considerations between software that is to run on stack memory and software that is to run on heap memory.

(a5) Discuss this statement. *"Conditional expressions in software, however complicated, will always evaluate to either True or False."*

[5 x 2 points = 10 points]

B2(b) Answer the following questions. You may provide examples in your answers.

(b1) Describe the basic concepts of the Apache Cassandra NoSQL distributed database design compared to conventional RDBMS database design.

[2 points]

(b2) Provide one(1) main difference between the Adapter design pattern and the Bridge design pattern.

[2 points]

(b3) Why is published documentation important for software design patterns? Provide two(2) reasons.

[2 points]

(b4) Describe the main purpose in implementing the thread-pool design pattern in a web server application?

[2 points]

B2(c) You are provided with the following design diagram for a Level 1 Data Flow
Diagram (DFD). Write in plain English and in complete sentences, your interpretation of
the specifications shown in the diagram below.

[7 points]

Figure B2(c) Level 1 Data Flow Diagram (DFD)
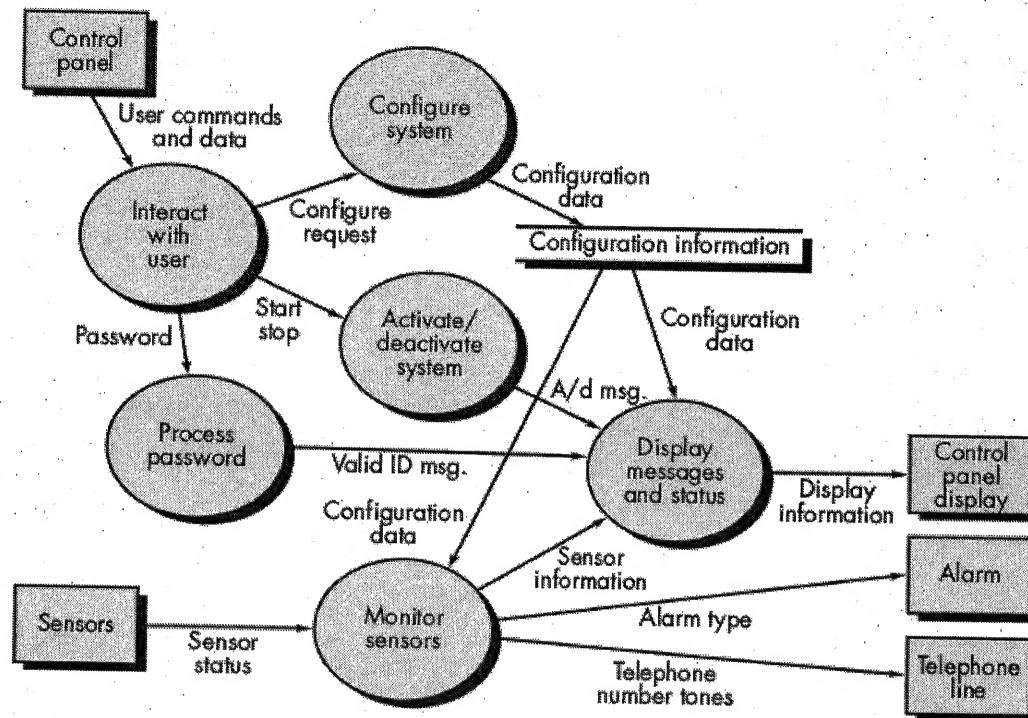
*Note: Think of this question as the reverse of the instructions given in your Software
Design Group Assignment. In this question, we provide you with the design diagram
Figure B2(c) above, and you are required to produce the requirements.*

Continued .....

QUESTION B3

B3(a) Answer the following questions. You may provide examples in your answers.

(a1) Discuss the issues of concern on cloud infrastructure reliability and cloud access security when designing software that will be hosted in the clouds.

(a2) What is Big Data? How is Big Data generated?

(a3) Why is it important to consider design quality for maintainability?

(a4) What does design quality for modularity mean?

(a5) How do we design a software system for fault-tolerance?

[5 x 2 points = 10 points]

B3(b) Answer the following questions. You may provide examples in your answers.

(b1) It was said that: *"The concepts of modularity and concurrency are natural and obvious in object-oriented design"*. Discuss this statement.

[2 points]

(b2) *"The Apache Storm application implements real-time stream processing design"*. Explain what this statement means.

[2 points]

(b3) *"The main contribution in the design of the AJAX (Asynchronous JavaScript And XML) framework is its asynchronous operations."* Explain why we consider its asynchronous operations as an important contribution.

[2 points]

(b4) Explain why security in communication is one of the main design challenges in the Internet of Things (IoT).
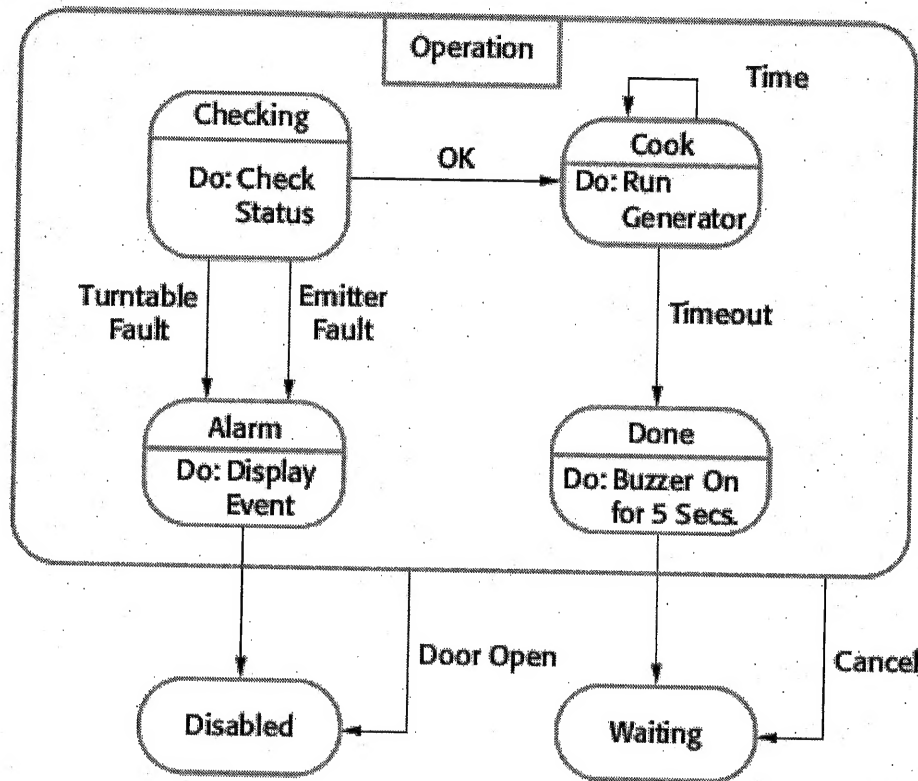
[2 points]

Continued ....

B3(c) You are provided with the following design diagram for the use-case scenario (operations) of the Microwave Oven. Write in plain English and in complete sentences, your interpretation of the specifications shown in the diagram below.

[7 points]

Figure B3(c) Operations of the Microwave Oven

Note: *Think of this question as the reverse of the instructions given in your Software Design Group Assignment. In this question, we provide you with the design diagram Figure B3(c) above, and you are required to produce the requirements.*

End of Page